TASK 3: DEVELOP AND REVIEW EXERCISE SCENARIO

Description

The scenario for a simulated nuclear power plant accident is developed jointly by the State and licensee and submitted to NRC and FEMA Regional offices for review. The FEMA RAC Chair reviews the scenario to confirm that the source term and scenario events are adequate to drive the agreed-upon exercise objectives and extent of play.

Milestone

State and licensee scenario developers jointly submit the scenario to FEMA at least 60 days prior to the exercise. The RAC Chair completes review of the scenario at least 45 days before the exercise. Final scenario adjustments to ensure adequate demonstration of objectives are made by the State and licensee at least 15 days prior to the exercise.

References

NUREG-0654.

Products

Exercise scenario.

Guidance

The exercise scenario should include plant conditions and offsite consequences sufficient to drive activities necessary for the demonstration of the agreed-upon exercise objectives.

The State and licensee should develop a scenario for submission to FEMA and the NRC that includes the following information:

- a chronology of all key events
- a narrative description of exercise events and activities
- meteorological data and forecasts
- radiological data, e.g., characteristics of release, projected dose, exposure rates, and concentrations in the environment.

The radiological data should be supported by and compatible with plant conditions and associated potential for releases or simulated releases. In the absence of a simulated

release, controller inject data should be developed to drive activities that require simulated exposure rates or concentrations in the environment.

The following guidance is provided for the development of exercise scenarios for play related to evacuation, sheltering, administration of potassium iodide (KI), decontamination, control of contaminated food and water, relocation, re-entry, and return. Doses and distances should be contextually determined in accordance with the following:

- o specific organizational plans
- o the geographical location of involved jurisdictions
- o the status of demonstrated objectives within six-year periods
- o the identification of uncorrected Areas Requiring Corrective Action (ARCA)
- o other exercise-specific considerations

Use of decision criteria. Exercises are designed to enable OROs to demonstrate the capability to make decisions on appropriate actions to protect the public and emergency workers using procedures and decision criteria established in the plans. The objectives to be demonstrated and the corresponding extent of play should be agreed upon and documented in a pre-exercise agreement by the State and FEMA prior to initiating the development of a scenario (Task 2).

Demonstration of decisions to implement evacuation and sheltering necessitates special consideration. **Initial** decisions to evacuate and shelter are typically based on plant conditions and associated recommendations by the licensee. These decisions usually prescribe evacuation to a predetermined distance (e.g., a two-mile radius and five miles in downwind sectors) and sheltering to a greater distance. **Subsequent** decisions to evacuate and shelter are typically based on a comparison of projected dose to the PAG, where the projected dose is calculated based on a simulated release or field measurement data (including meteorological data and forecasts) provided by controller injects. For these subsequent decisions, the projected dose should exceed the evacuation and sheltering PAGs to a distance greater than the initial recommendation, but not beyond the boundary of the plume pathway EPZ.

For each objective to be demonstrated in an exercise, the accident scenario should be sufficient to drive exercise play for the participating jurisdictions, in accordance with the

extent-of-play agreements. The distance from the nuclear power plant that a particular decision criterion (e.g., PAG) should be exceeded is contextually determined by the location of the jurisdictions designated to demonstrate the activity. For example, if controls on milk or food crops will be demonstrated, the PAGs should be exceeded in areas that involve production or processing of these products. Radiological data to support controller injects should be provided as part of the scenario.

It is not necessary to exceed all PAGs in order to demonstrate implementation of an action. For example, to demonstrate a decision to evacuate, either the thyroid or whole body PAG may be exceeded.

The following guidance applies scenario criteria to specific aspects of REP exercise play.

1. **Plume pathway exercise play:** This guidance applies when there is no demonstration of ingestion pathway exercise play, relocation, re-entry, or return (so called **plume-only** exercises). There are two basic approaches to satisfying the objectives and extent-of-play agreements for plume-only exercises. The **preferred approach** entails an integrated exercise where the accident scenario includes a combination of plant conditions and a simulated release of radioactive materials into the environment. In such an approach, the source term corresponding to the simulated release and resultant dose projections should be of sufficient magnitude and distance to drive the demonstration of exercise objectives and extent of play for the participating jurisdictions in accordance with the pre-exercise agreements. While this approach postulates a simulated release into the environment, **initial** protective action decision making and implementation may be based on plant conditions alone. **Subsequent** activities should be based on a combination of plant conditions and a simulated offsite release from the plant.

   For exercise play related to the use or non-use of **potassium iodide (KI)**, scenarios should contain sufficient radioiodine release to force participating jurisdictions to make decisions whether or not to use KI. It isn't necessary for scenarios to exceed the PAG for KI to adequately test decision making for its use or non-use. With respect to the distribution of KI, it is also generally not necessary to exceed the PAG for KI since distribution of KI is effected during the early stages of an emergency to permit its use prior to exposure of persons to a passing radioactive plume.

   Plume pathway scenario option: An alternative approach to satisfying objectives and extent-of-play agreements for plume-only exercises is to base decisions on

plant conditions with potential for release but with no simulated release of radiological materials from the plant. In such a scenario, plant conditions alone may be used to drive exercise play for all initial protective action decision making and implementation.

Subsequent protective action decision making and implementation would be based on a combination of plant conditions and controller injects. Controller injects would be used to drive components of field exercise play requiring contamination or exposure rates. Examples of such components are as follows:

- o dose projection (Objective 7)
- o decisions to decontaminate people and equipment (Objectives 18 and 22)
- o emergency worker use and understanding of established **turn back** values (Objective 5)
- o field monitoring (Objectives 6 and 8)

Under this alternative approach, OROs affected by the plume (as determined by the exercise scenario and in accordance with extent-of-play agreements) should implement appropriate and timely protective actions in accordance with the PAG strategies set forth in the plans.

Certain conditions should be met for FEMA to approve such an approach. (1) The involved OROs cannot have a FEMA-cited Deficiency related to protective action decision making in the last biennial exercise. (2) Scenarios should be designed to sustain potential projected doses for a sufficient period of time to drive OROs to implement protective actions. Such scenario designs would preclude OROs from waiting out the scenario in order to avoid making decisions on the implementation of protective actions. Failure of responsible OROs to take appropriate and timely protective actions may result in FEMA citing a Deficiency, even in the absence of a simulated release during the exercise. (3) The scenario should contain simulated contamination or exposure rates in the form of controller injects to drive field exercise play components requiring them.

The plume pathway exercise play option set forth above should not be used for exercises in which ingestion and/or relocation, re-entry, and return pathway exercise

play is carried out because of the need to have simulated deposition of radioactive materials for these activities.

2. **Ingestion pathway exercise play**: For ingestion exercise play, exercise scenarios should incorporate simulated offsite deposition exceeding the PAGs for food and water, as expressed in the plan. The deposition should exceed the PAGs in areas where typical food or water produced in the area would be found, but not outside the ingestion pathway EPZ. The source term should contain both iodine and long-lived radionuclides (e.g., Cesium). A Cesium-134 plus Cesium-137 to Iodine-131 ratio in the range of 0.2 to 0.6 is recommended. The areas to be affected by the radioactive plume and consequent ground deposition should be contextually determined, based on the participating jurisdictions and specific organizational objectives to be demonstrated.

   For relocation, re-entry, and return exercise play, the scenario should incorporate simulated offsite deposition that exceeds the relocation PAGs set forth in the plan in the jurisdictions specified in the extent-of-play agreement. For relocation activities, the projected dose is calculated for the first year. The source term should contain some long-lived radionuclides such as Cesium to prevent waiting out decay to avoid relocation decisions. A Cesium-134 plus Cesium-137 to Iodine-131 ratio in the range of 0.2 to 0.6 is recommended.

   It is recommended that ingestion, relocation, re-entry, and return exercise play be integrated within the same exercise, because of the similar scenario requirements of exercise play.

   FEMA Regional staff should use this guidance in reviewing and approving scenarios. FEMA and NRC Regional staffs should coordinate the scenario review and notify the involved State(s) and licensee of any necessary modifications. If scenarios do not meet these criteria, meetings should be conducted with all involved parties to identify and agree upon scenario modifications. If agreement cannot be reached, assistance should be requested from FEMA and NRC Headquarters.